Visible Objects of Concern: issues and challenges for workplace ethnographies in complex environments

Prof Paul Luff and Prof Christian Heath

Submission to Special Issue on 'Development of Ethnographic Organization Studies: Towards New Objects of Concern'

ABSTRACT

Over the past few decades we have witnessed the widespread deployment of technologies that enable real-time interaction between co-located and remote participants. These technologies and their accompanying organisational arrangements have created new forms of cooperation and collaboration. They also present challenges for ethnographers seeking to understand the practices, the 'lived work' of the participants. In particular they demand a concern with the physical, the material and the embodied, in other words with what has been termed multi-modality. We argue that it is through detailed analysis of specific instances, the circumstances of their use, that we can begin to discover the competencies, skills, the 'know how', that enables practice. In this paper, we consider one particular setting that is both distinctive because of its scale but also characteristic of many technology-saturated contemporary workplaces. We aim to show how in this case, as in others, the interactional and the sequential is an inextricable aspect of practice. To uncover these practices requires particular attention to the multi-modal but that this presents challenges for ethnographies, even those that draw on complex arrays of resources such as video-recordings. We suggest that this resonates with recent debates regarding how we conceive of materiality, the roles of technologies and practice.

1. Introduction

Contemporary developments in work and organisation pose significant challenges for ethnography and more generally qualitative research. The emergence of new specialisms and occupations, the transformation of the office and organisational space, and the wide-spread deployment of advanced technologies demand reconsideration of what constitutes data, how it is produced and perhaps most importantly, how it is be subject to investigation and analysis. As Rouleau at al (2014) note, these rapidly changing organisational environments have begun to lead to new forms of organisational ethnography**.** These include for example, field studies that involve teams of researchers working concurrently in multiple sites (Marcus 1995, Jarzabkowski, Bednarek and Cabantous 2015), novel ways of tracking and shadowing people as they move through different spaces (Raulet-Crose & Borzeix 2014) or integrating new kinds of materials and documents with fieldwork observations (Hine 2000, Kozinets 2015, Tunçalp and Lê 2014, Hassard et al. 2017). Indeed, there is wide-spread recognition that contemporary work relies upon distinctive affinities between the material and digital, between the local and the remote, and contingent interdependencies of action and activity that arise within distinct workplaces and in some cases unpredictable worksites.

These developments resonate with analytic concerns from those in science and technology studies, to take technology, the nonhuman, the material, and its agency seriously; to consider the interdependencies and interconnectedness of the human and nonhuman in action (Latour 1987, 2000). So, for example analysis of practice increasingly encompasses the material - objects, bodies, artefacts, tools, technologies (see for instance Schatzki 2001, 2002, Shove et al. 2012). Nevertheless, the emphasis on the interdependency and interconnectedness of agents has tended to be prioritised whilst the performance of practice has received less attention. In this paper we will draw on materials from two settings, control rooms, examples of what has been called technologically saturated domains (Suchman 1996), where personnel use a variety of complex technologies to collaborate with and monitor others. These technologies are interdependent and interconnected, combining visual and textual resources and allowing different ways of communicating with local and remote colleagues. We will uncover how they draw on the material artefacts, the various systems they use, and through embodied actions undertake, 'perform' their activities. Collaboration and co-ordination in this technologically-saturated setting relies on what might be considered the mundane uses of technologies and routine forms of interaction. Understanding the nature of these interdependencies in this complex domain raises methodological

problems for the ethnographer. It demands attention be paid to the material, to the embodied actions of the participants, it needs to be 'multi-modal'. This requires augmenting fieldwork with ways of accessing and attending to details of the collaboration and communication, of the interconnectedness of the individuals and the technologies.

A growing corpus of studies concerned with the investigation of work in complex, organisational environments draws on ethnomethodology and conversation analysis and focuses in particular on the analysis of video-recordings of naturally occurring activities, albeit augmented by field studies and the like. Sometimes known as workplace studies, this corpus of research is primarily concerned with addressing the social and interactional production of organisational activities. It focuses on the production of particular actions as they emerge within and contribute to the context at hand and the ways in which personnel and others participate in the ongoing activity. Sequence, and identifying the sequential relationship(s) between particular actions is critical in this regard, enabling the identification of particular practices and in evidencing how people orient to each other's conduct. These sequences through which participants produce and coordinate their actions rely upon a variety of resources be it talk, bodily conduct, or use the tools and technologies, objects and artefacts. A focus on sequence provides a means to develop rigorous analyses of materials gathered in everyday settings, particularly those that utilise video-recordings (see, for example Smets at al, 2014, LeBaron 2005, Heath and Luff 2000). In this paper, we would like to suggest that the growing communicative and technological complexities of certain forms of work environment, pose particular challenges for studies that prioritise the interactional production of activities and rely on video-based field studies for their 'data' and observations.

To reveal more about the nature of these challenges, both for studies that are grounded on sequential analyses of activities and for more general ethnographies of the contemporary workplace, we focus on one particular area of concern which addresses the nature of descriptions. From the participants' perspective, descriptions of objects, events and of problems are critical to how work is accomplished. They are essential for the identification and management of work. Through the way they are produced, their nature and character can have different implications and different consequences for others. They are a resource for collaboration, vehicles for co-ordinating actions between participants. We will draw on materials gathered in two control rooms, to reveal how participants produce descriptions and how these evolve to accomplish concerted organisational responses to critical problems. We will consider the detailed ways, participants through an interplay of the material, visual resources and ways of talking produce descriptions that contribute to the work in the setting. These descriptions, therefore serve as a resource for analysts. However, by considering the activities in a setting where activities are particularly dispersed, and where

technologies serve to mediate communication and collaboration, we suggest that the production of descriptions of objects of concern do not just pose challenges for the participants but also for analysts considering the accomplishment of organised activities in distributed environments.

2. Background

Recent lively debates concerning materiality and materialism suggest extending what is characterised as 'matter', addressing different forms of agency from human and 'non-humans' and taking seriously the concerns of 'embodied individuals' (Coole and Frost 2010). Whilst raising concerns with certain aspects of social constructionism, these conceptual frameworks still seek to draw on ethnography to understand the 'quotidian', the 'tacit, the 'details'. They also place demands to develop new forms of analysis, amongst which are 'multi-modal' analyses that suggest a rethinking of the dynamics of materialism. These developments maintain a commitment to the importance of materiality in social action and the practices of participants, indeed some characterise practice as the 'primary unit of enquiry' (Mol and Law 2004). The initiatives that have emerged have largely been informed by the contributions by Latour (1987, 2000) and others within science and technology studies. They have a commitment to taking the nonhuman, the material, and its agency seriously; to consider the interdependencies and interconnectedness of the human and nonhuman in action (e.g. Maller 2015). Reckwitz (2002**),** for example, defines practice as a 'routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge' (2002: 249-50). However, the focus on the interconnected has tended to give priority to 'networks', variously conceptualized, as the vehicle through which practice is instantiated and institutionalised. Despite the longstanding recognition with how practices emerge and how they change over time (Mol 2002), less attention is paid to how particular practices are applied on actual occasions with regard to the particular circumstances at hand: to 'the isolated moments in the performance of a practice' (Maller 2015:59). And yet, the occasioned performance of a practice raises important questions concerning agency and competence, the tacit knowledge, know-how and practical reasoning that enables and forms a critical aspect of particular practices.

The concern with the performance of practice, materiality and with embodied activities has informed a corpus of studies, known as workplace studies, which in quite different ways have been concerned with developing multi-modal analysis and the dynamics of material action. Also principally utilising an ethnographic approach, typically augmented with video-recordings and drawing on an ethnomethodological perspective (Garfinkel 1967**)** and conversation analysis (Sacks

1992), these studies have been concerned with uncovering the detailed ways in which participants co-ordinate their actions to accomplish their work. Typically, this is through a detailed sequential analysis of recordings of naturally occurring activities. Such an approach serves to warrant an analysis: a participants' conduct reveals a display of understanding of a prior action by a colleague which in turn provides the means for others to make sense of that participants' contribution. This emphasis on sequence and sequentiality enables a distinctive approach to considering the agency that arises amongst various individuals whilst they produce collaborative action.

To illustrate the distinctiveness of these from other ethnographic studies we might take one particular set of domains that has been a recurrent locale of concern for workplace studies, what have been characterised as 'centres of co-ordination' (Suchman, 1997), or sometimes 'control room studies' Whereas some ethnographic studies might, say, consider discourses of control (e.g. Fleming and Sturdy 2011) or how control and resistance are accomplished through the visual affordances of artefacts (Alcadipani and Islam 2017). Workplace Studies draw on naturally occurring recordings, typically audio-visual recordings, to reveal how in centres of co-ordination collaboration relies on detailed and subtle forms of interaction and seemingly mundane practices. They consider, for example, how these activities are shaped by the local environment; how the configuration of the organisational space, for example the arrangement of the consoles and displays features in the accomplishment of co-present interaction (Heath & Luff 1992, Suchman 1997) and how particular artefacts and their contents, like whiteboards, screens and documents serve as resources for collaboration (Goodwin & Goodwin 1996). Although workplace studies resonate with concerns raised regarding the nature of organisation space and informal interaction (e.g. Fayard and Weeks 2007), how the sense-making is accomplished drawing on different tools and technologies (Hultin and Mähring 2017) and how prediction and anticipation is ordered and organised in critical and complex environments (e.g. Knox et al. 2015), workplace studies pay close attention to the *in situ* production of activities in the setting. In particular they pay close attention to how the talk, visual conduct and material action of the participants are produced from moment-by-moment with regard to the ongoing conduct of others and in respect to features of the local environment. Taking one particular example from a control room setting, Kameo and Whalen (2015) reveal how material conduct and turns of talk are co-ordinated in an emergency despatch centre, how a controller makes sense of the talk of a remote colleague on the radio through resources made available by the technology, how they organize their talk to facilitate the entry of information into a computer system and how they display their understandings to remote colleagues (Whalen, 1995a, Kameo and Whalen 2015). In other workplace studies researchers reveal how participants are sensitive to quite subtle details of another's activities, even what those colleagues are typing

into a computer system (Luff & Heath, 2000), or how staff monitor or oversee the actions of colleagues or produce actions so they in turn, can be monitored, overheard or overseen (Goodwin & Goodwin, 1996; Heath & Luff, 1992; Watts et al., 1996). These studies pay careful attention to the details of the ways conduct is produced, for example how staff might read items from a document out aloud so they can be overheard, how statements are produced using particular prosodies and pacing so they can be heard by staff who are not visible to them (Goodwin, M. 1990, 1996), or how turns of talk are co-ordinated with visual conduct to imply specific courses of action that need to be undertaken by a colleague (Heath & Luff, 1992, 1996a). Such practices are necessarily embedded within the work practice of the setting; they are inexplicit and tacit. These practices are recurrent and underpin the ways activities are co-ordinated. Workplace studies make apparent the complexities of collaboration and how staff have to manage a range of diverse concerns in a material environment. They are concerned with 'networks' of individuals and technologies, and yet focus on how these are embedded within social interaction, and they primarily concerned with practice, as this is performed and how it emerges.

In this paper, we wish to explore the practice and knowledge, the skills and competencies that underpin how staff undertake their work in a technology-saturated environment. We will consider complex and contingent forms of practice and agency as participants engage with material technological artefacts to undertake concerted action with colleagues. We will reveal the details of the moment-to-moment accomplishment of these practices and show how a critical aspect of their work relies on seemingly mundane exchanges; about descriptions of features of the physical environment, where these can be about people, objects or locales.

We will first consider this in a setting where access to the material environment, although technologically rich, is circumscribed for both participants and for analysts. We provide a brief illustration of a sequential, multi-modal analysis of the performance of practice in this 'traditional' control room setting. We draw on this setting to reveal the challenges of developing a sequential analysis, for example how we can identify sequential relationships between specific actions by different participants. In a second setting the boundaries of the setting are less constrained, not only spatially but also organisationally. Here participants work together through digital, electronic and online resources, between the local and the remote, and contingent interdependencies of action and activity arise within the workplace. We consider how the materials that enable an analysis of work and collaboration within a more traditional control centre, become increasingly impoverished when we examine more complex organisational forms and this threatens the ability to develop a sequentially relevant analysis of an activity's production. These new organisational environments not only raise challenges for how to collect potentially relevant data but also in identifying how

activities by different participants are (sequentially) related to those of their colleagues and how these relationships can be seen as demonstrably relevant. In one sense, the problems faced by the ethnographer of such a domain is akin to the challenge for the participants' themselves, that is, to know what is relevant to the accomplishment of concerted action and by whom in the course of its development.

3. Methods

'Centres of co-ordination' that are a principal domain for workplace studies, are necessarily concerned with managing activities in remote settings and with staff in very dispersed locations. These settings, such as news rooms (Heath & Nicholls, 1997) financial trading rooms (Heath et al. 1994), air traffic control (Harper, Hughes, & Shapiro, 1991), ground control of airports (Goodwin & Goodwin, 1996; Suchman, 1993, 1997), public rail and underground systems (Filippi & Theureau, 1993; Heath & Luff, 1992; Heath & Luff, 1996a; Luff & Heath, 2000; Luff & Heath, 2002), emergency dispatch (Whalen, 1995a; Whalen & Zimmerman, 1987) and telecommunications restoration control rooms (Hindmarsh & Heath, 2000) might be concerned with activities that cover a large region, a city or even a country. They are technologically-saturated, involving information systems of different kinds, visual and textual technologies, physical objects, different kinds of documents and varied means of communication. They are co-located 'hubs' of activities where personnel with different responsibilities work and collaborate in the same place, managing resources and having access to activities and personnel outside of that location. Recently, there have been a number of changes to these kinds of centres. Whereas in the traditional control room, whilst there were a wide range of systems and technologies the capabilities of each largely remained distinct. Recently, there has been a greater integration between tools, technologies and devices. These technologies have also become more sophisticated, including more visual, graphical and location-based technologies. In concert with these changes there has also been a change of scale of the control rooms. Typically they have become much larger.

The studies we discuss in this paper both involved several researchers undertaking fieldwork in the control rooms and closely-related settings at the same time. Both can be considered as a form of *multi-sited* ethnography (cf. Marcus 1995, Malhotra & Majchrzak 2014). These studies are also *multi-modal*, the ethnographies were augmented by audio-visual recordings (cf.(Llewellyn & Hindmarsh 2010, Heath & Luff 2000). However, the analysis developed here is distinctive to say that of Smets and colleagues' concern with 'micro-practices' in terms of logics and detailed narrative descriptions of practice (Smets et al. 2014, 2015). Here we draw on fragments of audio-

visual recordings to consider sequences of action and reveal practices through which participants utilise material technologies to co-ordinate their activities with others.

In the first study, which considered collaboration and control in and between stations on London Underground, at various times 3 to 4 researchers gathered data. Because of the scale of the control rooms this typically involved each researcher focussing on one distinct control room, usually at the same time. In this way it was possible to consider responses to incidents that effected multiple locations across the network. At other times, the researchers considered different kinds of control rooms and locations at the same time. For example, whilst one researcher was collecting data, including audio-visual recordings and field observations in a station operations room, another would be gathering materials in a network or line control room and another undertaking fieldwork on a train or around the station. Audio-visual data collected was principally gathered using one fixed camera at each site, focusing on the participants and the technologies available to them (see figure 1 – bottom left). In all, over 300 hours of video recordings were collected in the course of this project.

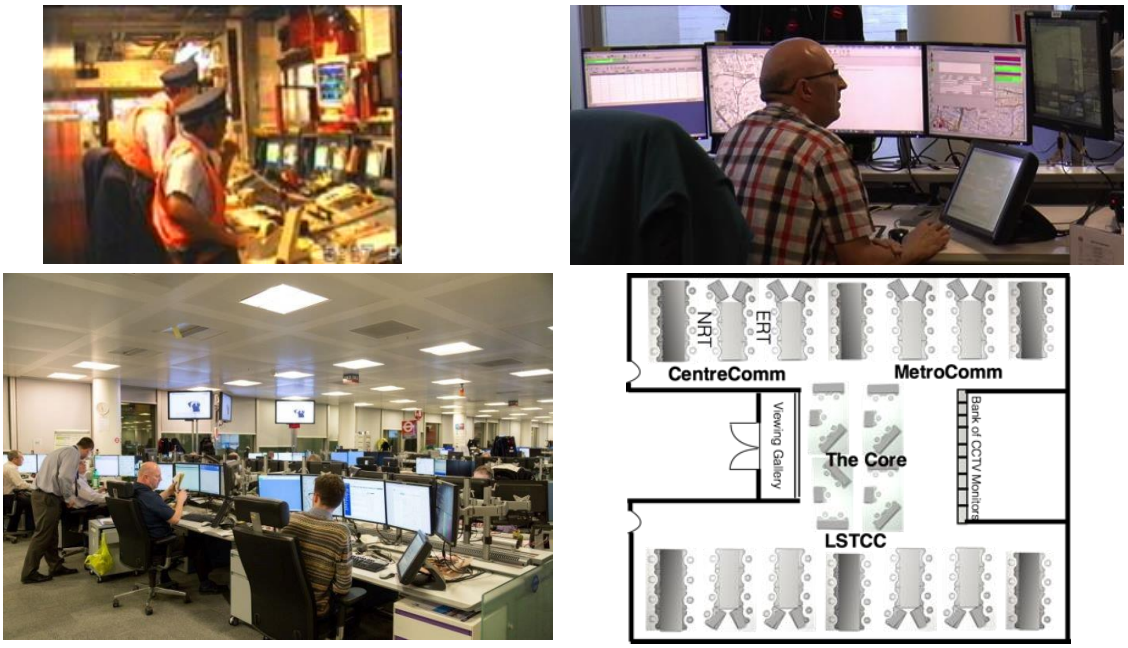


Figure 1: Examples of the domains focused on in this paper. On the top left an image of one of the control rooms considered: Piccadilly Operations room. This has one console, operated by one or two station supervisors and technologies, including various systems for monitoring traffic, making announcements, communicating with staff and operating the CCTV. On the bottom left is an image of a one area of a newer 'multi-centre control room - the London Surface Transport and Traffic Operations Centre: LSTTOC). This is taken of part of the CentreComm area. The graphical plan (bottom right) gives a sense of the overall space where over 100 staff are located working for three principal operations organizations (CentreComm, MetroComm and LSTCC). These are located in different zones. Top right is an image focusing on one 'work station' within Centrecomm.

The second study focused on one large multi-centre control room. This was also a control room responsible for transportation, but in this case surface traffic. Again, more than one researcher was involved at a time and the principal data were video-recordings. Researchers gathered data associated with different teams located in different areas of the control room. Because of the complexity of the activities in the local environment and the range of technologies each member of staff had available to them, we typically gathered data at each location using two cameras: one focused on the principal systems the staff member was using and one a slightly wider angle of the console within the local environment. Over 60 hours of video data were collected in this study. This provided us with materials regarding collocated collaboration as well as the details of the resources staff had available to them, for example, the maps, the CCTV images and the texts they relied upon.

Although the collection of video data in such settings necessarily has to be focused on particular domains within a setting, in both control centres these arrangements did allow for the possibility for gathering data in multiple sites at the same time (cf. Knox et al. 2015). If a problem that affected the locations where we were recording at the time, say with respect to a potential evacuation or another major incident, we could consider the materials gathered in these different locations. Although collecting material of such incidents was largely serendipitous, it was possible to select domains where inter-organisational collaboration could be anticipated, and these data have contributed to the analysis of work practices, collaborative activities and the use of technologies in these settings (Heath et al. 2002, Luff at al. 2000, Luff et al 2017).

In this paper, we aim to give a sense of the new kinds of analytic problem and the novel issues that arise when undertaking these kinds of ethnographies by considering an issue that pervades these studies of centres of co-ordination: how staff co-ordinate responses to problems that arise, how they assess the nature of a problem and then deploy a series of appropriate actions to be undertaken by themselves, colleagues and others in the same or in different organisations. Because of space constraints we will focus on the details of particular fragments of interaction from each setting. Drawing on these we will consider how a response is co-ordinated through the performance of particular practices – in these cases we focus on how objects of concern, features of the environment, are identified and how others who might have an interest in them are informed of their relevance. These practices rely on everyday descriptions.

4. Co-ordinating descriptions: Cohering organisations

In centres of co-ordination, descriptions are a critical resource for collaboration; whether this is so that critical incidents can be identified (Goodwin and Goodwin 1996; Goodwin 1997; Suchman

1996), or so that events are communicated appropriately to colleagues (Heath and Nicholls 1997) or so staff can distribute key details of an emergency to remote personnel (Kameo & Whalen 2015; Whalen, 1995a; Whalen & Zimmerman, 1987). Descriptions are not just simple accounts of a person, an object or an event but are shaped and assembled according to the circumstances at hand and the anticipated consequences of their receipt. We will consider one particular centre of co-ordination, a control room, to provide a sense of how these descriptions serve to co-ordinate activities across an organisation: in this case station operations rooms on the London Underground.

In each major station on London Underground there is an operations room or 'ops room' for short. It is normally staffed by one or two station supervisors who are responsible for overseeing the moment-to-moment operation of the station and for developing a coordinated response to problems and emergencies. Major interconnecting stations, such as Piccadilly Circus, Liverpool Street and Victoria handle up to ten thousand passengers a day. Maintaining the smooth flow of passengers requires that the incidents that arise are managed, wherever possible, with dispatch. The station supervisor has a range of resources to support the discovery, identification and management of problems and events. At any one time, there will be up to thirty staff out and about on the station; mainly station assistants who are responsible for 'manning' the ticket barriers, dealing with passengers on platforms, and dealing with problems that emerge in areas such as the entrance foyer, but also other staff including managers and personnel from other organisations. When issues arise, whether this is routine overcrowding or a potential emergency or critical incident, the nature of that problem needs to be identified by the supervisors and any actions that need to be taken need to be conveyed to the appropriate staff. Both the identification of problems and the production of commands and instructions typically rely on descriptions.

To assist supervisors station operations rooms contain a range of technologies. Perhaps the most important system is that for Close Circuit Television (CCTV). A typical control operations room will have between six to eight CCTV monitors, embedded within a console. These monitors provide access to more than a hundred cameras located throughout the station; on platforms, in interconnecting passageways, stairwells, over escalators, in foyers and the various entrances to the station, and in some cases to areas surrounding the station itself. The staff have a range of other equipment, including a radio system which allows staff in the station to speak to each other, public address systems to make announcements to areas within the station and additional equipment such as monitors for displaying traffic information.

Station staff have to co-ordinate responses to a range of routine problems including controlling the flow of passengers by making interventions to their route, stopping escalators, temporarily closing barriers or even closing the entire station for a while (Heath et al. 2002) as well as removing

potentially violent passengers or others who may be problematic to the smooth running of the station (Luff et al 2000). They also have to identify incidents that are less regular, but may be of great consequence. Staff draw on the capabilities of the technologies to assist them and deploy staff to intervene if necessary.

Consider the problem of a 'suspect package'. Staff on London Underground have long had to be sensitive to unaccompanied packages, and in certain circumstances, on finding one of these, will evacuate the station. They consist of everyday objects - briefcases, lunch-boxes, shopping bags, suitcases, boxes, sleeping bags - the sorts of objects that individuals routinely carry when using London Underground and the sort of object which is large enough to conceal an explosive or incendiary device. Packages become suspect when they are divorced from their owner; left seemingly unassociated with a particular individual within a station. Given the number of passengers travelling through London Underground, the problem of suspect packages can be a major problem. When one is found then the procedure requires the station to be evacuated which can severely affect the travel arrangements of thousands of people, and worse, if the alert is genuine it can cause death and destruction. If a suspect package is identified the station supervisors also need to inform line control centres so that trains no longer stop at the station or in more serious cases the service should suspended altogether on all lines passing through the station. Supervisors would also have to inform the police, various managers, nearby stations, and other staff that may be affected. How a suspect package is identified, how this is communicated to others and the actions that need to be taken all rely on descriptions: descriptions of the object itself, its location and also other features of the local environment.

Occasionally station supervisors will notice packages on the CCTV system such as bags or suitcases which appear to have no obvious owner. Their very visibility on camera and monitor however would tend to suggest that they are not an incendiary device or bomb, since terrorists like others are highly sensitive to the location of cameras. Given the number of CCTV images available, the movement of people around the station and their hidden nature, it is usually station staff who first notice what might be a 'suspect package'. In the following example a Station Assistant (SA) calls in on the radio to inform the Station Supervisor (SS) about an object he has found.

Fragment 1. Transcript 1

SA: Base to ()
SS: Go ahead
SA: Yes I've got small little black box down here: like what you put your tapes in, it's just lying on the ground. If you can turn the camera
SS: Where abouts are you?
SA: At the moment I'm in the corner of the steps with the () on the side of the steps, it's close to ()
SS Hang on a minute.
((looks at monitors))

SS: Base Lima: Three, the Inspector's on his way down to you.

It is worth noting a few points: the characterisation of the object; the concern with its precise location; and the failed attempt to see the object using the CCTV system. The supervisor has a colleague ('the inspector') go to the scene and inspect the object. A few moments later, the inspector calls the supervisor and recommends evacuating the station.

The discovery and characterisation of the object engenders a complex array of relevant actions and activities, both for staff and for passengers. So, for example it involves the supervisor informing both colleagues and passengers that they must immediately leave the station.

Fragment 1 Transcript 2

SS: *(over radio)}* Base to all staff Base to all staff Inspector Sands to the Operations Room. Inspector Sands to the Operations Room. Prepare for evacuation
SS: *((over PA))* Attention please ladies and gentlemen. This station is now being evacuated because of a security alert. All passengers please leave the station: by the nearest exit.
SS: All staff to your positions please.
SS: This station is being evacuated because of a security alert. All passengers please leave by the nearest exit, or as directed by staff

The announcement engenders various actions by different staff based in different locations around the station: encouraging people to leave the platform; stopping passengers entering the station, preventing passengers taking the downward escalators; and showing people the nearest exit. The announcements are the first actions within a series of activities rendered relevant by the discovery of the object: informing the transport police; monitoring the progress of the evacuation and encouraging passengers to leave; and informing the controllers of the two lines (Piccadilly and Bakerloo) which run through the station that an evacuation is taking place. There are sequential relationships between one action and the next, engendered through talk. The conduct of the line controllers themselves is dependent upon, and engendered by, the evacuation. There are, however, alternative courses of action that are dependent upon the characterisation of the object and in particular its location. Note that the inspector, who is near to the object, on being informed of the evacuation, specifies the object's location.

Fragment 1 Transcript 3

SS: *((on radio))* Base to Oscar One. I've notified the station is in the process of being evacuated.
I: Location of the object is bottom of stairs in interchange not way in.
((SS writes message))
SS: Bottom interchange. Received Oscar One.
.
.
SS: *((SS phones Bakerloo Line Controller))* Yes Piccadilly Circus we're evacuating again Gov' We've got a suspect package on the interchange subway between the Picc and the Bakerloo at the bottom of the stairs. non stop please:
SS: Thank you Gov'
.

SS: *((SS phones Piccadilly Line Controller))* Yes Yes. I'm Piccadilly Circus Can you non-stop your trains for us please, we have a suspect passage package at one of our cross passages

The inspector provides a description of the object which is designed to provide the supervisor with the resources with which to request a particular course of action from the respective line controllers. The characterisation and location are critical to determine the relevant courses of action to be taken by the line controllers. In particular, the location of the object in the interchange or cross passageways suggests that should the package explode then trains passing through the station would not be affected. If the package, or the device it potentially contains, is within reach of a platform ('the way in'), then controllers would be advised to cease all traffic passing through the station.

In their analysis of an evacuation of a major airport, Knox at el. (2015) powerfully show how such events can problematise the characterisation of different spaces around the airport, how they illustrate challenges to how 'order' and 'organisation' is conceived and how the relationship between material objects and people are considered. Knox at al. thus argue for a relational understanding of organisation. They suggest these problems are not just academic but practical problems for the participants; 'spaces appear mutable, agencies ineffectual, objects treacherous and informants unreliable'. (p. 1014).

In exploring the ways in which personnel discover, identify and describe the object, we can begin to consider how the action and activities of staff and indeed passengers within different locations emerge and coalesce to enable the safe and secure management of the incident. The principal vehicle through which the difficulty and its implications is made apparent is talk, with the spoken description of the object serving as a fulcrum to the staff's coordinated response. The identification and description of the object through the ways in which it is communicated to staff both in station and the line control rooms is built through successive sequences of talk and interaction that involve specific individuals in particular locations that enable the object's appropriate and accountable management. These sequences of talk and interaction form a trajectory that in turn embodies and reproduces the routine ways and order in which problems of this type, that is objects and descriptions of this type are responded to and managed by staff, with the supervisor and the operations room lying at the heart of the action. The concerted production of these sequences of activities, drawing on seemingly mundane descriptions, serve to provide an order and organisation to the management of a potentially critical or chaotic incident. The performance of these practices is achieved through the careful and detailed selection and design of these descriptions. Video-based field studies not only make features of these descriptions accessible for analysis, but can reveal how they are tied to the both the physical environment to which they refer and are sensitive to the interactional location, with regard to prior contributions from

colleagues and to subsequent actions. Notwithstanding the distributed character of the incident and its management, they can also reveal how material resources, including technologies such as CCTV and the like can underpin and order the management of the incident. These practices and the sequential relations they embody and inform, provide not simply ways of coordinating actions and activities, but inform the very ways in which events, activities, persons and this case objects are perceived and constituted.

5. Mediating descriptions: Co-located and Distributed Collaboration

Descriptions of critical incidents and events are not just transient resources for the real-time management of activities. They also are recorded and documented for colleagues and for various organisational purposes. In case above, the description of the incident would also be entered into a physical 'log book'. Such descriptions are also typically recorded into computer systems, where the entries can be accessible to a range of personnel across the organisation. This is the case in London's 'Surface Transport and Traffic Operations Centre' (STTOC). This is a large multi-centre control room which brings together three operations centres that were previously housed in different sites: the London Streets Traffic Control Centre (LSTCC), the Metropolitan Police Traffic Operation Control Centre (MetroComm) and London Buses Command and Control Centre (CentreComm). The control room is a location where staff responsible for monitoring and coordinating traffic on the city's streets are housed. Together, there are approximately100 staff housed in the same large room (see Figure 1 – bottom). The control room monitors and attempts to manage traffic congestion, identify incidents and manage major events on London's roads within the area of the M25 (about 600 square miles). Incidents related to surface transport are recorded on an incident logging system (see Figure 2).

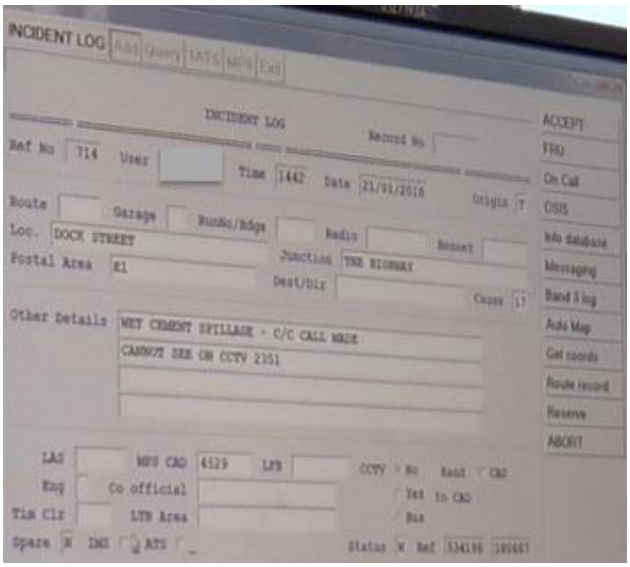


Figure 2: the window showing the incident log for the call in Fragment 2

The activities of the three centres are closely related: MetroComm manages the police response to traffic incidents, LSTCC controls London's traffic lights and traffic flow and CentreComm is the centre responsible for the control and management of London Busses. The descriptions that are entered can thus record contributions from members of each of the organisations. The original incident may have been identified by the police, the controllers of the busses may plan a response and this may involve changes to the traffic signaling systems in a particular area of London. The descriptions can also serve to help co-ordinate contributions from a team. In common with many large open-plan offices, this large space is divided into different zones for different teams, consisting of rows of back-to-back desks. Staff within each zone can sit at any location within the zone, and each working area has a standard set of technologies – most notably a bank of screens – on which the member of staff can configure windows for a range of applications. The incident log system is one of a number of applications each team member has access to and is used in combination with those other systems, including systems that allow access to CCTV images from thousands of traffic cameras across London, various computer-supported mapping systems that show the real-time location of traffic and technologies that keep track of pending calls and support communication with personnel in the control room and around London

If we consider one of these ‘sub’ control rooms CentreComm, it is divided into two teams with associated managers and related staff. Both teams of up to eight staff are located in a zone consisting of two back-to-back desks along which up to four staff can sit, each having the bank of five monitors on which staff can organize the various applications available to them. One team, the Emergency Response Team (ERT) principally handles incidents as they happen. These may be reported by bus drivers, the police, local bus operations centres or mobile staff employed by

CentreComm. Members of the ERT make the 'first response' to an incident. They also typically make the initial record, or description, of the incident in the log. The Network Response Team (NRT) manage and plan longer term responses to incidents. If an incident is likely to last a significant time (i.e. more than 20 minutes) then a complex plan may be required, for example, identifying alternative routes for busses to travel on, diverting busses along roads where they do not typically travel, and deploying mobile staff to ensure passengers are informed of such changes. They utilize the initial description to initiate their planning of this response. Hence, the descriptions serve to co-ordinate activities within a team. They have a rather standardized format: recording typically in order, a very brief account of the reported incident followed by the consequences of the incident and then any immediate action (if any) undertaken by the controller. Usually these are written in an abbreviated form, and sometimes utilise codes used by the police, for example: 'HEAVY TRAFFIC S/B/ SHEER WEIGHT OF TRAFFIC 10 MIN DELAYS', or 'FALL ON BUS DUE TO HEAVY BREAKING LAS DECLINED' or 'BLOCKED BUS STOP. DRV ASKING IF HE SHOULD SERVE STOP – NO' or 'LIBRARY ON FIRE – LFB HAVE CLOSED ROAD'[1] or 'RTC PI 2x CAR LAS AND MPS ON SCENE. DOWN TO ONE LANE E/B' [2].

Although staff do communicate with one other face-to-face or through the phone system about incidents, the size and scale of the room, as well as the number of personnel involved can make this problematic. It can be hard to identify who might become responsible for handling a particular incident. Hence, the Incidents Log is the principal resource for communication and collaboration within the control room. When writing a record of an incident staff are sensitive to the needs of colleagues both within the control room and elsewhere. There is an economy of description in how they are written. As they need to be read quickly, they are written succinctly. In this way the nature of the incident, any action or response taken can be made clear to colleagues (see Luff et al 2017 for further details). They are designed for colleagues for particular purposes, to make sense of the incident and provide a warrant for any actions taken.

Nevertheless, the contents of these records may not always be read unproblematically. In the following example, Robert (R), a member of the NRT team selects an incident from the log. This incident is on a road on the London Road Network, commonly known as 'Red Routes'. Roads on this network are critical to the flow of traffic through London's transport system and have special traffic regulations associated with them (e.g. very strict parking restrictions) and are closely

[1] 'S/B' is South Bound, 'LAS' refers to London Ambulance Service, 'DRV' is Driver and 'LFB' is London Fire Brigade)

[2] A Road Traffic Incident between two cars and involving personal injury. London Ambulance and the Metropolitan Police are at the location. Eastbound Traffic is reduced to only one lane.

monitored. After reading the description and checking the location of the incident through the CCTV system and the mapping system, Robert goes over to Michael, a member of the ERT team, who originally handled the incident, to discuss it.

10s

R selects top incident (in red) from incident list on the monitor second from the right

20s

R selects the camera map and after scrolling around the map, selects camera 2351 (the log description is on the left of the left display)

52s

R views junction

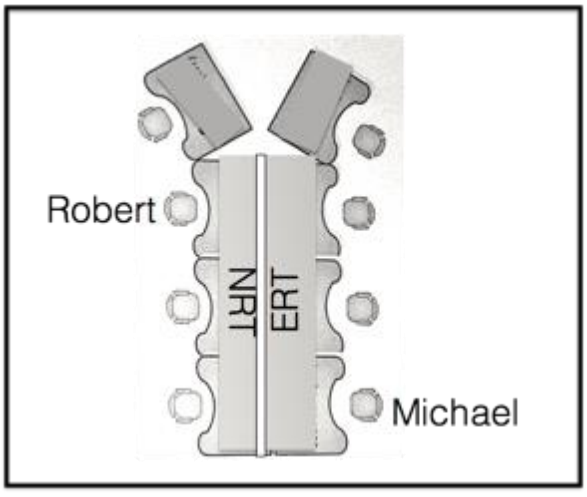
53s

R looks above monitor towards Michael

The original call from the police - also located in the STTOC control room - recorded by Michael reported a 'puddle of cement' at a junction of one of the major roads in East London on the London Road Network ('The Highway'). Following the call, Michael tries to find the problem on the CCTV system, but cannot locate it. He types the location of the 'Wet Cement Spillage' into the incident log and adds the comment: 'Cannot see on CCTV 2351' (see Figure 2). On completion, the incident is added to the Incidents List usually visible on the systems accessible to most of CentreComm staff. Just after it appears on this list, Robert selects the incident and examines the log. He then selects the camera mentioned and 0.5 seconds after the image appears on the screen, he looks over his monitor towards the ERT team and calls out to Michael.

Fragment 2: Transcript 1

R: (Michael)?
(8.0)
R: (Michael)?
(0.5)
R: two three five one Dock Street?
(0.3)
M: yeah
(0.2)
R: you've got on there cannot see on Cee Cee Tee Vee
(0.1)
M: I could not see it
(0.1)
R: (what's that) large brown mark (I wonder what that is) sheh eh
(0.1)
M: Really?
(.)
R: if you look on the Nor- the Northbound ( )
(0.3)



Robert appears to have found the problem on the image and from the identification in the log searches for the member of the ERT team who entered it. A little later Robert comes around to Michael's desk to discuss the incident. Michael selects camera 2351 again, panning the camera around the scene, directed by Robert, until a brown mark becomes visible and Robert points to this saying 'whats that then'.

Michael Richard

M :(oh) god yeah, look

Michael

M: shhh
(0.2)
R: no no go up (0.8)

Richard
Michael

…R: what's that then?

Michael's response to Robert provides some account of the problem he has faced: 'he said it was a puddle, I was looking for a puddle'. The appearance of the mark, although large, is not apparently wet. Nevertheless, together they clarify the location of the problem identified by the police. It is on a Red Route and so action will need to be taken about it. In his subsequent talk and interaction with Robert, it is apparent that the visual qualities of the problem are critical in both locating the problem – where it is on the road, and which roads it effects – and the subsequent actions to be taken – whether it is wet and could cause damage to vehicles or dry and could just cause an obstruction on the route.

Robert, returning to his desk, goes on to call another control centre in the STTOC - London Streets Traffic Control Centre (LSTCC) - the one responsible for maintaining the smooth running of all road traffic on the Red Routes, and also for repairing any defects. When Robert calls the LSTCC by phone he refers to someone losing a 'load of concrete'; a description designed for those responsible for clearing up the problem. In this call there again is a problem with identifying where the problem is – whether it is indeed on the junction of the road mentioned in the log ('Dock Street') or in a location where the street changes name. Whilst on the call Robert and the member of LSTCC sitting elsewhere in the control centre, view the same CCTV image through their own systems to clarify this. Robert then adds the line "LSTCC AWARE TLRN" to the incident log – 'TLRN' being the abbreviation for TfL London Road Network' (i.e. a 'Red Route'). The note provides an account

of why LSTCC were informed, and provides information from which a reader can assess the severity of the incident.

In the case above, as with fragment 1, the details of a simple description have consequences for a range of personnel. Staff from three different organisations (and four teams) collaborate to help resolve a problem, the nature of which was previously unclear and that has consequences for numerous drivers and passengers on a major thoroughfare in a large city. Throughout their management of the incident staff draw on different descriptions and characterisations of the problem provided in different media and modes. Initially, the police provide a description in a phone call (giving a characterisation as 'a puddle' accompanied by a location). This characterisation being relevant for the management of traffic through the area and reflecting its seriousness. Michael transforms this into a textual description as "Wet Cement Spillage" and completes fields giving the "Location" as "Dock Street" and the "Junction" as "The Highway": a description that (formally) characterises the kind of incident and accompanies this with a note revealing some uncertainty to its nature (recording that it cannot be independently assessed). Robert, when clarifying the problem to Michael calls what he sees as a 'brown mark' on the 'Northbound', and accompanies his description with a gesture to show its extent. When Robert calls the LSTCC by phone the description is again transformed, designed so that it is relevant and appropriate to another team who will be responsible for dealing with it. These descriptions made face-to-face or through the phone can be seen to be understood in particular ways, they have sequential relevancies for colleagues, with regard to how they are understood and the consequent actions that are taken.

The written descriptions, mediated through technology engender collaboration between personnel for different members of a range of organisation and have a range of consequences, whether this is for the safety of travellers, the management of traffic or the scheduling of public transport. As with descriptions produced through talk, written descriptions are designed for particular recipients, at a particular time and place (cf. Sacks et al. 1974, Heath & Luff, 1996b) . When the area under consideration is vast, as in a control room that covers the entirety of a large city, however, features can become 'de-ecologised': it being hard to determine the relevance of a particular detail, its consequences for others and the course of activities it entails. The 'recipient design' of descriptions, particularly textual descriptions, within multi-team organisations can thus become problematic. So, although there are a range of technologies to help identify and inspect features within the environment and a network of systems that serve to record incidents and mediate the responsibilities between several organisations and teams involved in their management, these may not be sufficient for participants to recognise problems and then develop adequate solutions.

In order to make sense of these records, participants need to assemble coherence, develop compatible identifications, from the various resources available and then configure appropriate responses for others in different organisations with differing concerns. However, when what ties the description of the material object to the organisational import of that description is not apparent, then the ability to design descriptions that are appropriate to their recipients can be undermined. The sequential relationship between the characterisation of a material object and its organisational consequences is fractured.

6. Discussion

The objects the participants are sensitive to in these settings may seem trivial – small black boxes, bags of powder, puddles of cement, slow moving busses or stationary bodies – but the consequences can be critical – suspect explosive devices, lengthy delays, major congestion or potential suicides. The material qualities of the objects are thus critical for the assessment of the character of the concern at hand. Staff who are responsible for co-ordinating a response rarely have direct access to their physical qualities. Instead, their access is mediated through technologies and often their relevance is only apparent through their description by others. These descriptions then set in train sequences of activities often by several participants in parallel. There is a sequential relationship between the characterisation of a material object and its organisational consequences. In some sense these are 'socio-material' relations (cf. Orlikowski 2007, Carlile et al. 2013), where the materiality is made relevant through the interactions of the participants. Despite the plethora of visual technologies, in contemporary centres of co-ordination these characterisations are increasingly being made through texts: features made apparent in talk are transformed to texts and texts are then resources for later instructions made through other means of communication, such as phones, radios or even through video. Analysis of how participants produce these texts and make the physical characteristics apparent reveal the relevancies of the material and the consequences of this materiality to the participants themselves, even when these material qualities are mediated through electronic technologies.

These new centres of co-ordination are saturated with technologies, involve people from different organisations and impact on the activities of the general public. In more ways than one they can be characterised in terms of 'networks' of actors, whether these are human or non-human (cf. Latour 1987, Law and Hassard 1999). However, such a characterisation seems to gloss the complex forms of collaboration and co-ordination engendered through sequences of activities. Even considering one element – a description and characterisation of a material feature of an object – reveals how its design both reflects its relevance and projects its consequences for others: it is a

resource that shapes the interplay of activities within and between organisations. Indeed, it seems to be due to the increased complexity and nature of the technologies that the textual description has become a critical resource for co-ordination.

There are a number of differences between the large-scale multi-centre control rooms and the conventional settings considered by workplace and related ethnographic studies. There is a complex division of labour and responsibility. Tasks and activities are increasingly screen and system based. There is usually an absence of a shared public display that reveals the state of current operations. The sheer number of personnel working within the domain and perhaps on the same event at any one time, undermines, or better, necessitates a solution, an order of practice, that enables coordination and collaboration. In the case considered here, these challenges are exacerbated by the extraordinary complexity of the domain of concern for the participants - a substantial and highly populated geographical area - the range of problems with which staff have to deal, and the range of services for whom any problem or incident may be relevant. For any incident and event and its description there are therefore a broad range of specialisms, services and personnel that might, at some point be implicated in its management. In consequence, a widely accessible resource, that is a description of an event, becomes of increasing importance. The transient character of talk as a form of communicative behaviour, a medium that passes or decays, is augmented or increasingly replaced by a medium, namely text, that enables a description to be contingently accessible and relevant to a broad range of relevant recipients. In turn, these descriptions of incidents and events are more formally structured to enable a broad range of interests to be brought to bear in their reading. In contrast, therefore to the more traditional transport control centre where reports of incidents and events were produced *post hoc* and largely for the purposes of accountability, in these large-scale control centres, the report is the principal vehicle through which personnel progressively manage incidents and events and through which concerted responses are produced.

These developments also pose challenges for those with an interest in the performance and accomplishment of practice and organisation, challenges that resonate with the practical problems faced by the participants themselves. Without too much difficulty we can gain access to the descriptions that personnel produce and modify in the course of dealing with an incident or event, whether this is through audio-visual materials or other logs or documentary records. By undertaking field work at particular desks, we can record features of an activity's production – what is said by participants and their use of particular technologies that feature in a description's production such as CCTV. But, given the range of personnel and services that may contingently contribute to or have some bearing upon an incident's management, it is not possible to capture or record the range of contributions that feature in the activity. Moreover, an electronic, textual description enables the

simultaneous production of various activities by different personnel in different locations. These activities and the interaction they involve are oriented to, even engendered by, the description, but only indirectly coordinated with actions undertaken by others both within and outside the control centre. In other words, highly complex and contingent forms of co-participation and collaboration arise in the emerging management of an incident, but are not necessarily ordered with regard to sequence and sequentiality characteristic of more traditional forms of institutional interaction. In turn, this poses an important analytic issue, that is how we explore, and demonstrate empirically, the relationship and the qualities of relationships between particular actions and activities – or more generally the contributions of various personnel from various services. The characterisation of a sequence of activities, relating a prior action to a next, that typically prioritises the sequential production of turns of talk is of less consequence. Settings such as these demand attention to be paid to the embodied practices through which participants engage with material objects and to how these practices are embedded within the local environment. This not only requires access to the material and embodied qualities of performative action, but a characterisation of sequence that relates features of talk, bodily action and of the local environment. These settings call for a multi-modal, multi-party ethnography of a particular kind and one that can account for interdependent parallel courses of action engendered by different and interrelated modes of communication.

Despite these methodological challenges, studies of these centres of co-ordination can reveal general issues of relevance to those considering the organisation of complex contemporary work. They serve to prioritise the consideration of organisations concerned with the management of highly contingent events facilitated by new technologies. They reveal new and emerging forms of collaboration where staff engage in distinct but interdependent parallel courses of action and they reveal the heterogeneous ways in which material objects are evoked and consequential for the everyday work of participants. They make apparent why it is critical to develop analyses of how the practices of participants are embedded within and serve to constitute their local context.

The incidents and events that are managed by staff in these control rooms can affect large numbers of people as they pass through an area. They transform the flows of traffic that can have critical knock-on consequences in widely dispersed locations for others. And yet these incidents are managed through the moment-to-moment interactions between participants through, talk, texts and visual conduct. These studies reveal the detailed dependencies between the local and the dispersed, between the micro and macro. In these settings different characterisations of features of organisational space are produced as part of the everyday work of the participants and have relevancy and consequences for those participants (cf. Halford 2004, Lefebre 1991). Staff manage their ‘organisational space’, juxtaposing the local with the remote, to assemble a coherence for

themselves and others. Their perception of space is bound to the organisational consequences of their actions, is shaped through their practices and how they accomplish them.

The problems participants face everyday in these control room settings no doubt recur in many other large modern distributed organisations. From moment-to-moment the participants have to manage a range of resources that might be accessible through a range of media, some transitory others more persistent, these may arise from the activities of participants who may be close colleagues or any member of a very large network of organisations and sub-organisations. Staff transform different kinds of 'information' through different media to serve the demands of different individuals, with differing responsibilities in those various organisations. They assemble coherence from a range of fragmented real-time resources that facilitates collaboration with collocated individuals and with those who are geographically dispersed throughout a large area, activities that have consequences for thousands or tens of thousands of other individuals. These highly dispersed yet interdependent forms of cooperation and collaboration pose significant challenges to field studies and qualitative methods, challenges that are methodological, analytic and theoretical, and yet it may be by paying attention to small details, the moments of interaction that one can reveal the complexity of collaboration within and across these organisations.

REFERENCES

Alcadipani, R and Islam, G. (2017) Modalities of opposition: Control and resistance via visual materiality. *Organization* 2017, Vol. 24(6) 866–891 .

Berndtsson, J., & Normark, M. (1999). The coordinative functions of flight strips: air traffic control work revisited. In *GROUP '99: Proceedings of the international ACM SIGGROUP conference on Supporting group work* (pp. 101–110). Phoenix, Arizona, USA: ACM.

Bowers, J. M., & Martin, D. (1999). Informing collaborative information visualization through an ethnography of ambulance control. In S. Bødker, M. Kyng, & K. Schmidt (Eds.), *ECSCW'99 Proceedings of the sixth conference on Computer Supported Cooperative Work* (pp. 309–330). Copenhagen, Denmark: Kluwer Academic Publishers.

Carlile, P. R., Nicolini, D., Langley, A., & Tsoukas, H. (Eds.). (2013). How matter matters: *Objects, artifacts, and materiality in organization studies (Vol. 3)*. Oxford University Press.

Coole, D. and Frost S. (eds.) (2010) *New Materialisms: Ontology, Agency and Politics.* Durham & London. Duke University Press

Fayard, A. and Weeks, J. (2007) Photocopiers and Water-coolers: The Affordances of Informal Interaction**,** Organization Studies 28(05): 605–634

Filippi, G., & Theureau, J. (1993). Analysing Cooperative Work in an Urban Traffic Control Room for the Design of a Coordination Support System. In G. de Michelis, C. Simone, & K. Schmidt (Eds.), *ECSCW '93* (pp. 171–186). Milan, Italy: Kluwer.

Fleming , P and Sturdy, A. (2011). Being yourself ' in the electronic sweatshop: New forms of normative control, *Human Relations* 64(2) 177–200

Garfinkel, H. (1967). *Studies in Ethnomethodology*. Englewood Cliffs, NJ: Prentice-Hall.

Goodwin, C., & Goodwin, M. (1996). Seeing as a Situated Activity: Formulating Planes. In Y. Engeström & D. Middleton (Eds.), *Cognition and Communication at Work* (pp. 61–95). Cambridge: Cambridge University Press.

Goodwin, M. H. (1990). Announcements in Their Environment: Back-To-Back Interaction in a Multi-Activity Work Setting. In *12th World Congress for Research on Activity Theory*. Lahti, Finland.

Goodwin, M. H. (1996). Informings and Announcements in their Environment: Prosody in a Multi-activity Setting. In E. Couper-Huhlen & M. Selting (Eds.), *Prosody in Conversation* (pp. 436–461). Cambridge: Cambridge University Press.

Halford, S. (2004) 'Towards a Sociology of Organizational Space' *Sociological Research Online, vol. 9, no. 1*.

Harper, R., Hughes, J. and Shapiro, D. (1991) 'Working in Harmony: An Examination of Computer Technology and Air Traffic Control', in Bowers, J. and Benford, S. D. (eds) *Studies in Computer Supported Cooperative Work. Theory Practice and Design*.) Amsterdam: North-Holland.

Hassard, J., Burns, D, Hyde, P and Burns J-P (2017) A Visual Turn for Organizational Ethnography: Embodying the Subject in Video-Based Research, *Organization Studies* 1–22

Heath, C., Jirotka, M., Luff, P., & Hindmarsh, J. (1994). Unpacking Collaboration: the Interactional Organisation of Trading in a City Dealing Room. *CSCW*, *3*(2), 147–165.

Heath, C., & Luff, P. (1992). Collaboration and Control: Crisis Management and Multimedia Technology in London Underground Line Control Rooms. *CSCW Journal*, *1*(1–2), 69–94.

Heath, C., & Luff, P. (1996a). Convergent Activities: Line Control and Passenger Information on London Underground. In Y. Engeström & D. Middleton (Eds.), *Cognition and Communication at Work* (pp. 96–129). Cambridge: Cambridge University Press.

Heath, C., & Luff, P. (1996b). Documents and professional practice: " bad " organisational

reasons for " good " clinical records. *Computer Supported Cooperative Work (CSCW)*, 354–363.
Heath, C., Luff, P., & Sanchez Svensson, M. (2002). Overseeing organisations: configuring action and its environment of action. *British Journal of Sociology*, *53*(2), 181–201.
Heath, C., & Nicholls, G. M. (1997). Animating Texts: Selective Readings of News Stories. In L. B. Resnick & R. Saljo (Eds.), *Discourse, Tools and Reasoning: Situated Cognition & Technologically Supported Environments*.
Hindmarsh, J., & Heath, C. (2000). Embodied Reference: A Study of Deixis in Workplace Interaction. *Journal of Pragmatics*, *32*(12), 1855–1878.
Llewellyn, N. & Hindmarsh, J. (2010). (Eds.). *Organisation, interaction and practice*. Cambridge: Cambridge University Press.
Hine, C. (2000), *Virtual Ethnography*, Sage Publications, London.
Hughes, J., Shapiro, D., Sharrock, W. W., Anderson, R. A., Harper, R., & Gibbons, S. C. (1988). *The Automation of Air Traffic Control*. Department of Sociology, Lancaster University.
Hultin , L. and Mähring, M. (2017) How practice *makes* sense in healthcare operations: Studying sensemaking as performative, material-discursive practice. *Human Relation*s 2017, Vol. 70(5) 566–593
Jarzabkowski Paula, R. Bednarek, L. Cabantous (2015). Conducting global team-based ethnography: Methodological challenges and reflections. *Human Relations* 68(1), pp.3-33
Kameo, N. & Jack Whalen, J. (2015). Organizing Documents: Standard Forms, Person Productio, H. n and Organizational Action. *Qualitative Sociology* (2015) 38:205–229
Knox, H., O'Doherty, D. P.Vurdubakis , T and Westrup, C. (2015). Something happened: Spectres of organization/disorganization at the airport. *Human Relations* 2015, Vol. 68(6) 1001–1020
Kozinets, Robert V. (2015), *Netnography: Redefined,* Second edition, Thousand Oaks, CA:SAGE Publications.
Latour, B. (1987). *Science in Action.* Cambridge, MA: Harvard University Press.
Latour, B. (2000) When things strike back: a possible contribution of 'science studies' to the social sciences, *British Journal of Sociology*, 51, 1, 107–23.
Law, J. and J, Hassard (eds) (1999). *Actor Network Theory and After*. Oxford, Blackwell.
LeBaron, C. (2005). Considering the social and material surround: Toward microethnographic understandings of nonverbal behavior. In V. Manusov (Ed.), *The Sourcebook of Nonverbal Measures.* Mahwah, NJ: Lawrence Erlbaum Associates, 493-506.
Lefebre, H. (1991) The Social Construction of Space Oxford, Blackwell.
Luff, P., & Heath, C. (2000). The Collaborative Production of Computer Commands in Command and Control. *International Journal of Human-Computer Studies*, *52*, 669–699.
Luff, P., & Heath, C. (2002). Broadcast Talk: Initiating Calls Through a Computer-Mediated Technology. *Research on Language & Social Interaction*, *35*(3), 337–366.
Luff, P., Heath, C. C., & Jirotka, M. (2000). Surveying the Scene: Technologies for Everyday Awareness and Monitoring in Control Rooms. *Interacting With Computers*, *13*, 193–228.
Luff, P,Heath, C, Patel, M, Vom Lehn, D and; Highfield, A. (2017). Creating Interdependencies : Managing Incidents in Large Organizational Environments. *Human Computer Interaction*, 18.12.2017, p. 1-41.
Mackay, W. (1999). Is paper safer? The role of paper flight strips in air traffic control. *Transactions on Computer-Human Interaction (TOCHI)*, *6*(4), 311–340.
Malhotra, A. and Majchrzak, A. (2014). Enhancing performance of geographically distributed teams through targeted use of information and communication technologies. *Human Relations* 2014, Vol. 67(4) 389–411
Maller, C.J. (2015) Understanding health through social practices: performance and materiality in everyday life. *Sociology of Health & Illness* Vol. 37 No. 1: 52–66
Marcus, G.E. (1995), "Ethnography in/of the world system: the emergence of multi-sited

ethnography", *Annual Review of Anthropology,* Vol. 24 No. 1, pp. 95-117.
Mol, A. (2002). *The body multiple: ontology in medical practice*. Durham, North Carolina: Duke University Press.
Mol, A. and J. Law, (2004) Embodied Action, Enacted Bodies. The Example of Hypoglycaemia, *Body & Society* Vol. 10 (2-3): 2004, 43-62
Orlikowski, W. J. (2007). Sociomaterial practices: Exploring technology at work. Organization studies, 28(9), 1435-1448.
Raulet-Croset,, N. & Borzeix, A. (2014) "Researching spatial practices through Walks: "on the move" and "walking with"", Journal of Organizational Ethnography, Vol. 3 Issue: 1, pp.27-4
Randall, D. R., & Schmidt, K. (2016). Reconsidering "Awareness" in CSCW. *CSCW Journal*, *25*(4–5).
Reckwitz, A. (2002) Toward a theory of social practices: a development in culturalist theorizing, *European Journal of Social Theory*, 5, 2, 243–263.
Rouleau, L. De Rond, M. and Musca, G. (2014) From the Ethnographic Turn to New Forms of Organizational Ethnography, J*ournal of Organizational Ethnography* Vol. 3 No. 1, 2014 pp. 2-9
Sacks, H. (1992). *Lectures on Conversation*. (2 vols., G. Jefferson, Ed.). Oxford: Blackwell.
Sacks, H., E. Schegloff & G. Jefferson (1974). A simplest systematics for the organization of turn-taking for conversation. Language, 50, 696–735.
Schatzki, T. (2001) Practice theory. In T.R. Schatzki, K. Knorr Cetina and E. Von Savigny. (eds) *The Practice Turn in Contemporary Theory.* New York: Routledge.
Schatzki, T. (2002) *The Site of the Social: A Philosophical Account of the Constitution of Social Life and Change*. Pennsylvania: Pennsylvania State University Press.
Schmidt, K. (2002). The Problem with "Awareness": Introductory Remarks on "Awareness in CSCW." *Comput. Supported Coop. Work*, *11*(3), 285–298.
Schmidt, K. (2016). Preface to the Special Issue on "Reconsidering 'Awareness' in CSCW." *CSCW Journal*, *25*(4–5), 229–233.
Schmidt, K., Heath, C., & Rodden, T. (2002). *Special Issue of International Journal of Computer Supported Cooperative Work: Awareness* (Vol. 11). Kluwer Academic Publishers.
Shove, E., Pantzar, M. and Watson, M. (2012) *The Dynamics of Social Practice: Everyday Life and How It Changes.* London: Sage.
Smets, M., Burke, G., Jarzabkowski,P. and P. Spee, (2014) "Charting new territory for organizational ethnography: Insights from a team-based video ethnography", *Journal of Organizational Ethnography*, Vol. 3 Issue: 1, pp.10-26.
Smets, M,, Jarzabkowski, P, Burke, G. T. and Pl Spee (2015). Reinsurance Trading in Lloyd's of London: Balancing Conflicting-yet-Complementary Logics in Practice. A*cademy of Management Journal* Vol. 58, 3
Suchman, L. (1993). Technologies of Accountability: On Lizards and Aeroplanes. In G. Button (Ed.), *Technology in Working Order* (pp. 113–126). London: Routledge.
Suchman, L. (1996). Constituting Shared Workspaces. In Y. Engeström & D. Middleton (Eds.), *Cognition and Communication at Work* (pp. 35–60). Cambridge: Cambridge University Press.
Suchman, L. (1997). Centers of Coordination: A case and some themes. In L. B. Resnick, R. Säljö, C. Pontecorvo, & B. Burge (Eds.), *Discourse, Tools, and Reasoning: Essays on Situated Cognition* (pp. 41–62). Berlin: Springer-Verlag.
Tenenberg, J., Roth, W.-M., & Socha, D. (2016). From I-Awareness to We-Awareness in CSCW. *CSCW Journal*, *25*(4–5), 235–278.
Tunçalp, D and Lê, (P. L. 2014) "(Re)Locating boundaries: a systematic review of online ethnography", *Journal of Organizational Ethnography*, Vol. 3 Issue: 1, pp.59-79,

https://doi.org/10.1108/JOE-11-2012-0048
Watts, J. C., Woods, D. D., Corban, J. M., Patterson, E. S., Kerr, R. L., & Hicks, L. C. (1996). Voice Loops as Cooperative Aids in Space Shuttle Mission Control. In M. S. Ackerman (Ed.), *CSCW '96* (pp. 48–56). Cambridge, MA: ACM Press.
Whalen, J. (1995a). A Technology of Order Production: Computer-Aided Dispatch in Public Safety Communications. In P. ten Have & G. Psathas (Eds.), *Situated Order: Studies in the Social Organisation of Talk and Embodied Activities* (pp. 187–230). Washington: University Press of America.
Whalen, J., & Vinkhuyzen, E. (2000). Expert Systems in (Inter)Action: Diagnosing Document Machine Problems Over the Telephone. In P. Luff, J. Hindmarsh, & C. Heath (Eds.), *Workplace Studies: Recovering Work Practice and Informing System Design* (pp. 92–140). Cambridge: Cambridge University Press.
Whalen, J., Whalen, M., & Henderson, K. (2002). Improvisational choreography in a teleservice work. *British Journal of Sociology*, *53*(2), 239–259.
Whalen, M., & Zimmerman, D. H. (1987). Sequential and institutional contexts in calls for help. *Social Psychology Quarterly*, *50*, 172–185.